



Poor family relationships in adolescence as a risk factor of in-patient somatic care across the life course: Findings from a 1953 cohort

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ABSTRACT

Background: Prior research has shown that poor family relations during upbringing have long-term detrimental effects on mental health. Few previous studies have, however, focused on somatic health outcomes and studies rarely cover the life span until retirement age. The aims of the current study were, firstly, to examine the association between poor family relationships in adolescence and in-patient somatic care across the life course whilst adjusting for confounders at baseline and concurrent psychiatric in-patient care; and secondly, to compare the risks of somatic and psychiatric in-patient care across the life course.

Methods: Prospective data from the Stockholm Birth Cohort study were used, with 2636 participants born in 1953 who were followed up until 2016. Information on family relationships was collected from the participants' mothers in 1968. Annual information on in-patient somatic and psychiatric care was retrieved from official register data from 1969 to 2016.

Results: Poisson regressions showed that poor family relationships in adolescence were associated with an increased risk of in-patient somatic care in mid- and especially in late adulthood (ages 44–53 and 54–63 years), even when controlling for the co-occurrence of psychiatric illness and a range of childhood conditions. No statistically significant association was observed in early adulthood (ages 16–43 years), when controlling for confounders. These findings are in sharp contrast to the analyses of inpatient psychiatric care, according to which the association with poor family relations was strongest in early adulthood and thereafter attenuated across the life course.

Conclusion: Poor family relationships in adolescence are associated with an increased risk of severe consequences for somatic health lasting to late adulthood even when controlling for confounders including in-patient psychiatric care, emphasising the potentially important role of early interventions.

1. Introduction

It is well documented that adverse childhood experiences have a negative impact on individuals' health and development across the life span (Felitti et al., 1998; Norman et al., 2012; Hughes et al., 2017; Herzog & Schmah, 2018). One important aspect of childhood adversities is dysfunctional social relationships in the family of origin (Repetti et al., 2002). Cross-sectional studies have demonstrated that adolescents who report relational strain in the family have an increased likelihood of reporting subjective health complaints (Låftman & Östberg; Bohman et al., 2010) as well as of suffering from clinical depression and other

mental disorders (Marmorstein & Iacono, 2004; Alaie et al., 2020; Scheeber et al., 2007). Compared with other stressors there is some evidence that family conflict is especially strongly related to adolescent mental disorders. In a study of a population of 16-year-old adolescents in Uppsala, Sweden, who were screened for depression, Olsson (1998) investigated the association between current depression and 20 different negative life events including, e.g., parents' death and physical abuse, and identified conflicts with and between parents as the variables most strongly associated with depression. Olsson (1998) suggested that the potential long-term chronicity of milder negative life events, such as family conflicts, resulted in a comparably greater negative impact on

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clinical depression than sudden stressful life events like parents' or siblings' death.

Experiencing adverse family relationships during upbringing may also have long-term health consequences. Prospective studies have reported poor family relationships in adolescence to be associated with an increased risk of adverse mental health outcomes in adulthood (Weich et al., 2009; Morgan et al., 2012; Berg, Kiviruusu, Karvonen, Rahkonen, & Huurre, 2017). Especially family conflict seems to be strongly related to some mental disorders in adulthood (Alaie et al., 2020). A few retrospective and prospective studies have also shown links between poor family relationships in adolescence and later somatic health problems or disease. Analysing data collected amongst a Swedish nationally representative sample of adults, Lundberg (1993) demonstrated that participants who reported retrospectively about dissension in the family during upbringing, had a higher likelihood of self-reported illness 13 years later, as well as of an increased risk of mortality up until 16 years later. Compared with the other childhood conditions that were studied – economic hardship, large family, and broken family – dissension in the family showed the strongest associations with all the studied outcomes, i.e., general physical health, aches and pains, circulatory ill-health, mental ill-health, as well as mortality (Lundberg, 1993). Also other studies have reported associations between adverse parent-child relations in childhood and different types of somatic health outcomes in adulthood, including less than good perceived health and activity limitations (Elstad, 2005), recurrent health problems (Stewart-Brown et al., 2005), and functional somatic symptoms (Landstedt et al., 2015). However, most prior studies have relied on self-reported data on somatic disease based on information collected at one or few points in time. Data about severe somatic health consequences like in-patient care are largely lacking and none of the cited studies followed the participants until retirement age. This lack of knowledge was highlighted in a review by Repetti et al. (2011), who also called for population-based studies following individuals across the life span.

In a study of poor family relationships and somatic disease, it is also relevant to examine if any such association varies across the life course, since several somatic diseases are age-dependent and some occur mostly later in life, while others tend to occur early or during all parts of the life span. The study by Alm et al. (2020), based on the same data as the current one, showed that poor family relationships in adolescence were associated with an increased risk of in-patient psychiatric care up until mid-adulthood, but that the effect attenuated over time. A relevant question is if a similar or different pattern can be seen for individuals who experienced poor family relationships in adolescence and in-patient somatic care.

Poor mental health has been shown to partly account for the association between adverse childhood conditions and poor physical health in adulthood (Monnat & Chandler, 2015). Thus, another relevant question is if a hypothetical increased risk of adult in-patient somatic care is explained by mental ill-health, which is known to be more prevalent in individuals who have experienced poor family relations during their upbringing (Weich et al., 2009; Morgan et al., 2012; Berg, Kiviruusu, Karvonen, Rahkonen, & Huurre, 2017; Alaie et al., 2020). Furthermore, when examining the association between poor family relations in adolescence and somatic ill-health later in life, it is important to take potential confounders into account, e.g., childhood family socioeconomic status, and childhood adversities such as economic poverty, parental mental illness, parental alcohol abuse, and the family's contact with the child services.

The aims of the present study were, firstly, to examine the association between poor family relationships in adolescence and in-patient somatic disease across the life course, whilst also taking into account the co-occurrence of psychiatric disease as well as a range of important childhood adversities and conditions whilst adjusting for confounders at baseline and concurrent psychiatric in-patient care, and secondly, to compare the risks of in-patient somatic and psychiatric care across the life course in individuals who experienced poor family relationships in

adolescence.

2. Methods

2.1. Data and study population

The data were derived from the Stockholm Birth Cohort study (SBC). The SBC database consists of two de-identified datasets that have been combined: The Metropolitan Study database including all individuals ($n = 15117$) born in 1953 who also lived in Stockholm ten years later, and the Health, Illness, Income, and Work Database (HSIA).

The Metropolitan Study data include extensive information from surveys and administrative registers. In 1966 (i.e., the year when the cohort members of the Metropolitan Study turned 13), the participants were asked to complete a classroom questionnaire, including questions on peer relations, interest in school, and future plans. In 1968 (i.e., the year when the cohort members turned 15), the Family Study was carried out. For a subsample of the cohort members, interviews were performed with their parents, mostly their mothers. These interviews included questions about the mothers' attitudes to education and aspirations for their child, but also on child rearing and on family relations. In all, 4021 cohort members were sampled for the Family Study. Out of these, interviews were carried out with the mothers of 3651 cohort members (91%). The Metropolitan Study also includes register data with information on social problems in the family of origin reported by the Social Authorities, as well as register data on the parents' health, income and occupation.

The Health, Illness, Income, and Work database (HSIA) includes official register information on, e.g., income, social welfare reciprocity, and health on all individuals living in Sweden in 1980 or 1990.

Through the combined data, it is possible to follow the individuals born in 1953 from childhood and until the age of 63, in 2016. The current study was based on information from the subsample of mothers participating in the Family Study within the Metropolitan study and annual official register information from the HSIA in the time period 1969–2016 ($n = 3651$). The study sample is further restricted to participants who were living with both their biological parents in 1968 (at age 15) and who had at least one sibling, and who resided in Sweden at the start of the follow-up period (i.e., in 1969), rendering a study sample comprising 2636 individuals. In the analyses of in-patient somatic care at different ages, we excluded participants who had deceased or emigrated prior to each period, and thus the number of individuals in these analyses varied between 2463 and 2636.

Ethical approval has been provided by the Regional Ethical Review Board of Stockholm (2017/34-31/5 and 2017/684-32). More information on the data material is available elsewhere (Janson, 1995; Stenberg & Vågerö, 2006; Stenberg et al., 2007; Almquist et al., 2020).

2.2. Measures

In-patient somatic care was constructed from annual information in the period 1969–2016 derived from the Hospital Discharge Register on individuals admitted for in-patient treatment. The variable captures the number of hospital care episodes. The following codes were used: ICD-8 (1969–1986) Chapters 1–4, 6–13, 16, 18; ICD-9 (1987–1996) Chapters 1–4, 6–13, 12–13, 16–18; ICD-10 (1997–2016) Chapters 1–4, 6–15, 18, 21. The different in-patient somatic care diagnostic groups were coded as follows: Coronary disease: ICD-8 Chapter 7; ICD-9 Chapter 7; ICD-10 Chapter 9. Cancer: ICD-8 Chapter 2; ICD-9 Chapter 2; ICD-10 Chapter 2. Respiratory disease: ICD-8 Chapter 8; ICD-9 Chapter 8; ICD-10 Chapter 10. Neurological disease: ICD-8 Chapter 6; ICD-9 Chapter 6; ICD-10 Chapter 6. Infectious disease: ICD-8 Chapter 1; ICD-9 Chapter 1; ICD-10 Chapter 1. Musculoskeletal disease: ICD-8 Chapter 13; ICD-9 Chapter 13; ICD-10 Chapter 13. Endocrine disease: ICD-8 Chapter 3; ICD-9 Chapter 3; ICD-10 Chapter 4. Hematological disease: ICD-8 Chapter 4; ICD-9 Chapter 4; ICD-10 Chapter 3. Gastro-

intestinal disease: ICD-8 Chapter 9; ICD-9 Chapter 9; ICD-10 Chapter 11. Urinary tract disease: ICD-8 Chapter 10; ICD-9 Chapter 10; ICD-10 Chapter 14. Skin disease: ICD-8 Chapter 12, ICD-9 Chapter 12; ICD-10 Chapter 12. Other diseases: ICD-8 Chapters 11, 16, 18; ICD-9 Chapters 11, 16; ICD-10 Chapter 7, 8, 16, 17, 19, 20. Obstetric complications were excluded from the analyses, since they were only recorded for women and especially at younger ages.

Family relations was based on information from the following four questions, answered by the participants' mothers in the Family Study in 1968 (i.e., when the respondents were 15 years of age): 1) "How would you describe the relationship between you and your son/daughter?"; 2) "How would you describe the relationship between your husband and your son/daughter?"; 3) "How would you describe the relationship between your son/daughter and his/her siblings?"; 4) "How would you describe the relationship between you and your husband?" The response categories were: (1) 'very good', (2) 'rather good', (3) 'neither good nor bad', (4) 'rather bad', and (5) 'very bad'. The scores of the four questions were reversed and summed to an index ranging 4–20; higher values indicating better family relations. The items showed good internal consistency (Cronbach's alpha = 0.75). Because of the skewed distribution, with a majority of the responding mothers reporting 'very good' or 'rather good' family relations, we distinguished three categories indicating 'good' (scores 19–20), 'intermediate' (scores 16–18), and 'poor' (scores <16) relations. With this categorisation, participants at approximately the bottom decile of the index were classified as having had poor family relations in adolescence. The cutoff implied that the mothers in this category had not necessarily reported 'bad' family relations in an absolute sense. In a relative sense, however, it was possible to label their family relationships as poor. The measure has been used previously (Alm et al., 2019, 2020).

Gender had two categories: male and female.

Household social class was based on information collected in 1963, when the study participants were 10 years old, on the occupation of the participant's father (or, if information on this was missing, on the occupation of the mother), and coded into: 1) upper non-manual workers; 2) lower non-manual workers, self-employed, and farmers; and 3) manual workers and unclassified.

Household economic poverty was based on register information and indicates social welfare reciprocity in the family of origin in the period 1953–65 (i.e. when the study participants were 0–12 years). A dichotomous variable was created, distinguishing between those who did not receive any social welfare during the period, and those who received social welfare on at least one occasion during the period.

Parental mental illness was based on information indicating if the study participant's parents had been registered by the social authorities for mental illness at any time point during the period 1953–65. A dichotomous variable was constructed, indicating whether or not (at least one of) the study participant's parents had been registered by the social authorities for mental illness.

In-patient psychiatric care was constructed from annual information in the period 1969–2016 derived from the Hospital Discharge Register on individuals admitted for in-patient treatment. The following codes were used: ICD-8 Chapter 5, codes 290–309; ICD-9 Chapter 5, codes 290–314; ICD-10 Chapter 5, codes F00–F69.

2.3. Statistical method

Poisson regression modelling was used, estimating the relative risk of in-patient somatic care between ages 16 and 63 among participants with 'good', 'intermediate', and 'poor' family relations in adolescence. Incidence rate ratios (IRR) and 95% confidence intervals (95% CI) are presented. Unadjusted models (including one independent or control variable at a time) and fully adjusted models (mutually adjusting for family relationships as well as the full set of control variables) were performed. All individuals alive and residing in Sweden at the onset of each study period are included in the analyses. Observations are then

censored at emigration or death, using the exposure command in Stata 16 (StataCorp, 2019).

3. Results

Descriptives of the data are presented in Table 1. The mean number of events of in-patient somatic care between ages 16 and 63 was 2.7. Among the participants, 31.2% had 0 events, 20.7% had 1 event, 29.5% had 2–4 events, 13.5% had 5–9 events, and 5.1% had 10 or more events of in-patient somatic care during this period. The mean value of the index measuring family relationships in adolescence was 17.9. According to our categorisation, about half the sample (48.1%) had good family relations, 42.8% had intermediate relations, and 9.1% had poor family relations. About half of the sample were males (51.4%) and about half were females (48.6%). With regards to other conditions in childhood, 22.4% of the sample grew up in upper class or upper middle class households, 40.2% in households classified as intermediate or lower middle class, entrepreneurs or farmers, and 37.4% in working class or unclassified households. Furthermore, 12.3% of the participants had experiences of household economic poverty and 2.9% of parental mental illness. Of the participants, 10.6% had been hospitalised due to psychiatric illness at the age of 16–63 years.

Results from Poisson regressions with in-patient somatic care at ages 16–63 as the dependent variable are presented in Table 2. The column displaying the mean number of events by each independent variable shows a gradient pattern between family relationships in adolescence and the number of in-patient somatic care events. The average number of events was 2.4 for those with good family relations, 2.8 for those with intermediate relations, and 3.7 for those with poor family relations.

The unadjusted Poisson regression analyses reveal that this gradient pattern was statistically significant. Compared with participants with good family relations in adolescence, an excess risk of in-patient somatic care was seen for those with intermediate relations (IRR 1.20, 95% CI 1.14–1.26), and especially for those with poor family relations (IRR 1.55, 95% CI 1.44–1.68). The unadjusted analyses also showed that women had a higher risk of in-patient somatic care than men (IRR 1.27, 95% CI 1.21–1.33). Further, there were differences in in-patient somatic care by household social class background: compared with participants with an upper-non manual background, those with an intermediate/lower non-manual worker or farmer/entrepreneur background had an

Table 1
Descriptives of the study variables. (n = 2636).

	Mean	S.d.
Number of events of in-patient somatic care in age 16–63 years	2.7	4.4
Family relationships (index)	17.9	1.9
	N	%
Number of events of in-patient somatic care in age 16–63 years		
0 events	822	31.2
1 event	545	20.7
2–4 events	778	29.5
5–9 events	356	13.5
10+ events	135	5.1
Family relations		
Good	1268	48.1
Intermediate	1129	42.8
Poor	239	9.1
Gender		
Males	1355	51.4
Females	1281	48.6
Household social class		
Upper class/upper middle class	591	22.4
Intermediate/lower middle class/entrepreneur/farmer	1060	40.2
Working class/unclassified	985	37.4
Household economic poverty	325	12.3
Parental mental illness	76	2.9
Psychiatric care in age 16–63 years	280	10.6

Source: Based on authors' own calculations from the SBC database.

Table 2

Associations between family relations in adolescence and in-patient somatic care at ages 16–63 years. Incidence rate ratios (IRR) and 95% confidence intervals (95% CI) from Poisson regressions. Results statistically significant at the 5%-level are reported in bold. n = 2636.

	Mean no of events	Unadjusted ^a	Adjusted ^b
		IRR (95% CI)	IRR (95% CI)
Family relations			
Good (ref.)	2.4	1.00	1.00
Intermediate	2.8	1.20 (1.14–1.26)	1.09 (1.04–1.15)
Poor	3.7	1.55 (1.44–1.68)	1.21 (1.12–1.31)
Gender			
Males (ref.)	2.4	1.00	1.00
Females	3.1	1.27 (1.21–1.33)	1.29 (1.23–1.35)
Household social class			
Upper non-manual (ref.)	2.1	1.00	1.00
Interm./lower non manual/entrepreneur/farmer	2.6	1.24 (1.16–1.32)	1.18 (1.11–1.26)
Manual worker	3.2	1.52 (1.42–1.62)	1.30 (1.21–1.39)
Household economic poverty	3.9	1.60 (1.51–1.70)	1.21 (1.13–1.30)
Parental mental illness	4.5	1.73 (1.55–1.92)	1.15 (1.02–1.29)
Psychiatric care in age 16–63 years	6.0	2.75 (2.60–2.90)	2.57 (2.43–2.72)

Source: Based on authors' own calculations from the SBC data base.

^a Includes one independent or one control variable at a time.

^b Mutually adjusts for all independent and control variables.

excess risk (IRR 1.24, 95% CI 1.16–1.32), as did those with a manual worker background (IRR 1.52, 95% CI 1.42–1.62). Participants with experiences of household economic poverty during upbringing had an excess risk of in-patient somatic care (IRR 1.60, 95% CI 1.51–1.70). Also those with experiences of parental mental illness during upbringing had

an excess risk of in-patient somatic care up until age 63 (IRR 1.73, 95% CI 1.55–1.92). Psychiatric care in age 16–63 was associated with a higher risk of in-patient somatic care during the same period (IRR 2.75, 95% CI 2.60–2.90). We also assessed the unadjusted associations between parental alcohol abuse and contact with the child services with in-

Table 3

Associations between family relations in adolescence and in-patient somatic care at ages 16–33, 34–43, 44–53 and 54–63 years, respectively. Incidence rate ratios (IRR) and 95% confidence intervals (95% CI) from Poisson regressions. Results statistically significant at the 5%-level are reported in bold. n = 2463–2636.

	16–33 years (n = 2636)		34–43 years (n = 2564)		44–53 years (n = 2525)		54–63 years (n = 2463)	
	Unadjusted ^a	Adjusted ^b						
	IRR (95% CI)							
Family relations								
Good (ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Intermediate	1.17 (1.07–1.28)	1.02 (0.93–1.12)	1.36 (1.20–1.53)	1.22 (1.08–1.37)	1.06 (0.95–1.17)	1.00 (0.90–1.10)	1.20 (1.11–1.30)	1.15 (1.06–1.24)
Poor	1.53 (1.34–1.75)	1.07 (0.93–1.23)	1.47 (1.21–1.78)	1.06 (0.87–1.29)	1.43 (1.23–1.67)	1.18 (1.01–1.39)	1.84 (1.65–2.06)	1.66 (1.48–1.87)
Gender								
Males (ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Females	1.96 (1.80–2.14)	1.96 (1.79–2.14)	1.50 (1.34–1.69)	1.53 (1.36–1.72)	1.18 (1.07–1.30)	1.24 (1.13–1.37)	0.81 (0.75–0.87)	0.82 (0.76–0.88)
Household social class								
Upper non-manual (ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Interm./lower non manual/ entrepreneur/farmer	1.22 (1.08–1.38)	1.16 (1.03–1.32)	1.12 (0.95–1.32)	1.00 (0.84–1.18)	1.29 (1.13–1.48)	1.21 (1.05–1.39)	1.31 (1.18–1.45)	1.27 (1.15–1.41)
Manual worker	1.66 (1.48–1.87)	1.45 (1.28–1.64)	1.70 (1.45–1.99)	1.29 (1.09–1.52)	1.37 (1.19–1.57)	1.17 (1.01–1.35)	1.36 (1.23–1.51)	1.26 (1.13–1.40)
Household economic poverty	1.70 (1.53–1.90)	1.27 (1.12–1.43)	2.11 (1.84–2.41)	1.46 (1.24–1.71)	1.59 (1.41–1.81)	1.44 (1.25–1.66)	1.22 (1.10–1.36)	1.04 (0.92–1.17)
Parental mental illness	1.84 (1.52–2.22)	1.06 (0.86–1.31)	2.58 (2.07–3.22)	1.21 (0.94–1.56)	1.43 (1.11–1.83)	0.90 (0.69–1.17)	1.08 (0.87–1.33)	0.81 (0.64–1.02)
Psychiatric care in same age period	3.53 (3.16–3.94)	3.24 (2.88–3.63)	5.72 (4.96–6.59)	5.00 (4.31–5.80)	4.95 (4.33–5.65)	4.86 (4.25–5.56)	3.52 (3.15–3.93)	3.23 (2.89–3.61)
Mean no of events	0.83		0.47		0.66		1.18	

Based on authors' own calculations from the SBC data base.

^a Includes one independent or one control variable at a time.

^b Mutually adjusts for all independent and control variables.

patient somatic care (not presented in Table), but these did not turn out to be statistically significant and were therefore not included in further analyses.

The adjusted analysis shows that, compared with good family relations, both intermediate and poor family relations were associated with an excess risk of in-patient somatic care, even when adjusting for the full set of control variables (intermediate relations: IRR 1.09, 95% CI 1.04–1.15; poor relations: IRR 1.21, 95% CI 1.12–1.31). The excess risk of in-patient somatic care among women remained robust and statistically significant in the adjusted analysis (IRR 1.29, 95% CI 1.23–1.35). Statistically significant differences by household social class, household economic poverty, parental mental illness, and psychiatric care remained in the fully adjusted analysis, although with somewhat attenuated estimates.

Subsequently, we performed analyses of family relations in adolescence and the risk of in-patient somatic care at different ages, with results presented in Table 3. The unadjusted analyses showed that poor family relations were significantly associated with an increased risk of in-patient somatic care at 16–33 years (IRR 1.53, 95% CI 1.34–1.75), at 34–43 years (IRR 1.47, 95% CI 1.21–1.78), at 44–53 years (IRR 1.43, 95% CI 1.23–1.67) and at 54–63 years (IRR 1.84, 95% CI 1.65–2.06). In the adjusted analyses, however, the association between poor family relations and in-patient somatic care was non-significant up until mid-adulthood (16–33 years: IRR 1.07, 95% CI 0.93–1.23; 34–43 years: IRR 1.06; 95% CI 0.87–1.29). By contrast, at ages 44–53, there was a statistically significant association between poor family relations and in-patient somatic care (IRR 1.18, 95% CI 1.01–1.39), and at ages 54–63, the association was even stronger (IRR 1.66, 95% CI 1.48–1.87).

Further analyses (presented in the Appendix, Tables A1–A4) show that especially psychiatric care in the same age period contributed to accounting for the association between poor family relations and in-patient somatic care at all ages. In addition, we performed analyses of specific somatic diagnostic categories at ages 44–63 (presented in the Appendix, Table A5). Analyses were performed for the diagnostic categories with $n > 29$ individuals who had at least one in-patient somatic care event. Due to the fact that the association between poor family relations in adolescence and in-patient somatic care was statistically significant only at ages 44–53 and 54–63 years (as shown in Table 3), we analysed in-patient somatic care only at ages 44 and above. The analyses showed links between poor family relations and several types of somatic disease, including coronary disease, cancer, gastro-intestinal and musculoskeletal disease. Additionally, there were statistically significant associations between intermediate family relations and respiratory, infectious, and other diseases. Due to small numbers and the risk of

chance findings due to the multiple comparisons, statistical significance with Bonferroni correction for p values is also presented in Table A5. Applying the Bonferroni correction, statistically significant associations remained between poor family relations and cancer and musculoskeletal disease, as well as between intermediate relations and respiratory and other diseases.

Finally, we compared the associations between poor family relations and somatic and psychiatric in-patient care across the life course. Fig. 1 presents the associations between poor family relations (vs. good) and in-patient somatic and psychiatric care, respectively, by age category. The plotted estimates for in-patient somatic care are the incidence rate ratios with 95% confidence intervals displayed in the adjusted models in Table 3. The estimates presented for in-patient psychiatric care are incidence rate ratios and 95% confidence intervals from Poisson regressions, adjusted for gender, household social class, household economic poverty, parental mental illness, and in-patient somatic care in the same age period. The figure shows that whereas the association between poor family relations and in-patient psychiatric care attenuated across the life course, the opposite was true concerning the association between poor family relations and in-patient somatic care, which instead was statistically significant at 44–53 and 54–63 years only.

4. Discussion

The first aim of this study was to investigate if poor family relationships in adolescence predicted in-patient somatic care across the life course whilst adjusting for confounders at baseline and concurrent psychiatric in-patient care. Analyses of the risk of in-patient somatic care at different ages showed that the association with poor family relations was statistically significant only in mid- and especially in late adulthood (i.e., at 44–53 and 54–63 years of age), when controlling for childhood household social class and family adversities in terms of economic poverty and parental mental illness, as well as for the co-occurrence of psychiatric disease. The excess risk at ages 44–53 years was 18% and at ages 54–63 years 66%, and thus of substantial effect size. In younger ages there was a significant association with in-patient somatic care but this was accounted for by confounders. Especially in-patient psychiatric care contributed to the association between poor family relations in adolescence and somatic health problems in early adulthood, reflecting prior research (see also Monnat & Chandler, 2015). Yet, the independent association between poor family relations in adolescence and in-patient somatic care in mid- and late adulthood indicates that we also need to look for other explanations than the co-occurrence of in-patient psychiatric care.

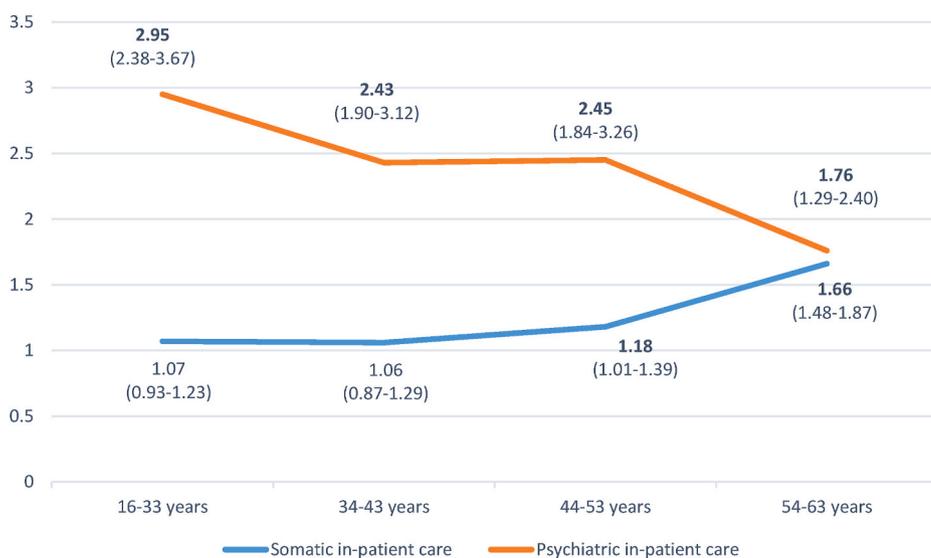


Fig. 1. Associations between poor family relations (vs. good) and in-patient somatic and psychiatric care, respectively, by age category. Incidence rate ratios adjusted for gender, household social class, household economic poverty, and parental mental illness. Analyses of in-patient somatic care are also adjusted for in-patient psychiatric care in the same age period. Analyses of in-patient psychiatric care are also adjusted for in-patient somatic care in the same age period. Results statistically significant at the 5%-level are reported in bold. $n = 2463$ – 2636 .

First, as concerns *social* factors, previous research indicates an association between adverse family relationships in adolescence and low adult socioeconomic status (Monnat & Chandler, 2015) as well as economic adversity (Berg, Kiviruusu, Karvonen, & Huurre, 2017), factors which are in turn known to be linked with adverse somatic health outcomes (Glymour et al., 2015). Another potential type of pathway between poor family relations and later somatic disease involves health risk behaviours (Repetti et al., 2002; Stewart-Brown et al., 2005; Monnat & Chandler, 2015; Chen et al., 2017). For instance, adverse family relations have been shown to be linked with increased risks of smoking, alcohol dependence and drug use (Repetti et al., 2002; Chen et al., 2017). Such health risk behaviors increase the likelihood of developing other risk factors that eventually can cause age related diseases, such as, e.g., coronary disease.

Second, the association between poor family relationships and in-patient somatic care may also be explained by *biological* factors. The exposure to stress during childhood might cause irreparable harm to the body and make it vulnerable to the development of somatic disease late in life. The model of allostatic load (McEwen, 1998; McEwen & Stellar, 1993) provides one possible explanation for the finding that poor family relationships was associated with an increased risk of in-patient somatic care in late adulthood. Allostatic load refers to “a multisystem indicator of risk that is thought to reflect cumulative wear-and-tear on physiological systems, and that predicts risk for cardiovascular and other mortality” (Chen et al., 2017, p. 557). According to this model, prolonged exposure to stress may lead to dysfunction in individuals’ stress response and immune systems (Repetti et al., 2011), which increases the likelihood of developing different risk factors for age related diseases, e.g., high blood pressure, high cholesterol levels, high body fat levels, and diabetes. These risk factors may in turn develop into, e.g., cardiovascular disease like heart failure, stroke, and cardiac infarction. The results of this study are in line with the model of allostatic load, in that an association was reported for poor family relationships and age-related diseases in late adulthood.

The second aim of the current study was to compare the risks of in-patient somatic and psychiatric care across the life course in individuals who experienced poor family relationships in adolescence. As discussed above, the finding that poor family relationships were associated with an increased risk of in-patient somatic care in mid- and late adulthood, but not in early adulthood, may be due to the fact that many stress-related somatic illnesses tend to appear late in life. The finding that the increased risk of in-patient psychiatric care was instead highest in early adulthood, and thereafter attenuated across the life course (see also Alm et al., 2020), suggests that the *mental* scars of poor family relations in childhood may heal over time. One possible partial explanation for the inverse patterns for in-patient somatic and psychiatric care is that the use of psychiatric care buffers against the recurrence of psychiatric illness, but not against the development of somatic illness. Recent research has highlighted that specialty mental health service use is protective of relapse of mental disorder (Copeland et al., 2020), and accordingly, the attenuated association with in-patient care reported in the current study may partly be due to the fact that a certain portion of individuals with experiences of poor family relations had already received psychiatric care. Another possible explanation for the inverse patterns for in-patient somatic and psychiatric care is that, as mentioned above, several stress-related somatic diseases develop slower than mental disorders and therefore occur mostly late in life. In addition, the physical health consequences of health risk behaviours do not become visible immediately. Notwithstanding, our findings indicate that patients in psychiatric care should be clinically monitored not only with respect to their risk of relapse of mental illness, but also with respect to their increased risk of developing somatic disease. Additionally, family interventions in families with conflicts may be of importance to reduce the risk of mental disorders in the offspring, and tentatively also the risk of somatic disease.

4.1. Methodological considerations

This study has several strengths, most notably the link between survey data and annual register information on in-patient somatic care until retirement age, as well as the fact that information on family relations during upbringing was prospectively measured. Relatedly, the study does not suffer from recall bias, neither for family relationships and other conditions in childhood, nor for in-patient care across the life course. Furthermore, the follow-up register data imply that there was very low attrition. This also means that there was no systematic attrition bias in the sample during the follow-up period, apart from that related to participants’ death. In a previous study based on the same data we showed that poor family relationships during upbringing were associated with premature mortality (Alm et al., 2019), and obviously both in-patient care and mortality indicate health problems. It is however likely that there are participants who died without preceding in-patient care. These deaths are not captured as “health problems” or “disease” in our analyses, implying that the findings interpreted as associations between poor family relationships and somatic and psychiatric disease (rather than in-patient care specifically) may be somewhat underestimated. There are however also limitations. One weakness concerns our main independent variable of interest – family relations. The measure was not based on a previously validated scale, although it has been used in previous studies based on the same data material (Alm et al., 2019, 2020). Additionally, the measure does not capture poor family relations in an absolute sense, but in a relative one. We lack information about explicitly negative relational aspects such as family conflict. Furthermore, the measure was based on mothers’ reports only, which may have restricted the validity of the measure. For a more encompassing assessment of the family relations, information collected also among other family members would have been beneficial. Family relations were also assessed at only one point in time. To examine the duration and persistence of poor family relationships, information collected on several occasions would have been valuable. The fact that our analyses include only participants living in nuclear families and with at least one sibling should also be addressed. We do however not see any strong reasons why the associations between poor family relationships in adolescence and in-patient somatic care in late life would not be found also among individuals growing up with a single parent and/or as an only child.

It should also be acknowledged that we cannot rule out the possibility of unobserved confounding. For instance, personality traits such as impulsivity are known to be heritable (e.g., Niv et al., 2012) and may cause both poor family relationships and health-damaging behaviours in adolescence and in later life. Future studies would benefit from including such measures.

5. Conclusions

Using prospective data from the Stockholm Birth Cohort study, this study showed that poor family relationships in adolescence were associated with an increased risk of in-patient somatic care in late adulthood, even when controlling for the co-occurrence of psychiatric illness and a range of childhood conditions. By contrast, the association between poor family relations and in-patient psychiatric care was highest in early adulthood and thereafter attenuated across the life span. In conclusion, the study suggests that poor family relationships in adolescence can have severe long-term consequences for both somatic and mental health, emphasising the potentially important role of early interventions.

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Author statement

All authors have conceived the study and drafted the manuscript. Susanne Alm has performed the statistical analyses.

Ethical approval

Ethical approval has been provided by the Regional Ethical Review Board of Stockholm (2017/34-31/5 and 2017/684-32).

Declaration of competing interest

The authors declare no conflict of interest.

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Appendix**Table A1**

Associations between family relations in adolescence and in-patient somatic care at ages 16–33 years. Incidence rate ratios (IRR) and 95% confidence intervals (95% CI) from Poisson regressions. Results statistically significant at the 5%-level are reported in bold. (n = 2636)

	Model 1	Model 2	Model 3	Model 4	Model 5
	IRR (95% CI)				
Family relations					
Good (ref.)	1.00	1.00	1.00	1.00	1.00
Intermediate	1.15 (1.05–1.25)	1.11 (1.02–1.22)	1.12 (1.03–1.23)	1.14 (1.04–1.24)	1.05 (0.96–1.15)
Poor	1.44 (1.26–1.65)	1.33 (1.16–1.53)	1.36 (1.18–1.55)	1.39 (1.21–1.59)	1.17 (1.02–1.34)
Gender					
Males (ref.)	1.00	1.00	1.00	1.00	1.00
Females	1.94 (1.77–2.11)	1.94 (1.77–2.11)	1.92 (1.76–2.10)	1.93 (1.77–2.11)	1.95 (1.79–2.13)
Household social class					
Upper non-manual (ref.)		1.00			
Interm./lower non manual/entrepreneur/farmer		1.19 (1.05–1.34)			
Manual worker		1.60 (1.42–1.80)			
Household economic poverty			1.63 (1.46–1.81)		
Parental mental illness				1.71 (1.41–2.06)	
Psychiatric care in same age period					3.45 (3.08–3.86)

Source: All tables are based on authors' own calculations from the SBC data base.

Table A2

Associations between family relations in adolescence and in-patient somatic care at ages 34–43 years. Incidence rate ratios (IRR) and 95% confidence intervals (95% CI) from Poisson regressions. Results statistically significant at the 5%-level are reported in bold. (n = 2564)

	Model 1	Model 2	Model 3	Model 4	Model 5
	IRR (95% CI)				
Family relations					
Good (ref.)	1.00	1.00	1.00	1.00	1.00
Intermediate	1.34 (1.19–1.51)	1.29 (1.15–1.46)	1.29 (1.15–1.46)	1.31 (1.16–1.48)	1.25 (1.11–1.41)
Poor	1.42 (1.17–1.71)	1.30 (1.08–1.58)	1.30 (1.07–1.57)	1.31 (1.08–1.59)	1.20 (0.99–1.46)
Gender					
Males (ref.)	1.00	1.00	1.00	1.00	1.00
Females	1.48 (1.32–1.66)	1.48 (1.32–1.66)	1.47 (1.31–1.65)	1.48 (1.32–1.66)	1.54 (1.37–1.73)
Household social class					
Upper non-manual (ref.)		1.00			
Interm./lower non manual/entrepreneur/farmer		1.09 (0.92–1.29)			
Manual worker		1.63 (1.39–1.91)			
Household economic poverty			2.03 (1.77–2.32)		
Parental mental illness				2.43 (1.94–3.03)	
Psychiatric care in same age period					5.70 (4.94–6.58)

Source: All tables are based on authors' own calculations from the SBC data base.

Table A3

Associations between family relations in adolescence and in-patient somatic care at ages 44–53 years. Incidence rate ratios (IRR) and 95% confidence intervals (95% CI) from Poisson regressions. Results statistically significant at the 5%-level are reported in bold. (n = 2525)

	Model 1	Model 2	Model 3	Model 4	Model 5
	IRR (95% CI)				
Family relations					

(continued on next page)

Table A3 (continued)

	Model 1	Model 2	Model 3	Model 4	Model 5
	IRR (95% CI)				
Good (ref.)	1.00	1.00	1.00	1.00	1.00
Intermediate	1.05 (0.95–1.16)	1.03 (0.93–1.15)	1.03 (0.93–1.14)	1.05 (0.94–1.16)	1.02 (0.92–1.13)
Poor	1.41 (1.21–1.65)	1.36 (1.17–1.60)	1.35 (1.15–1.58)	1.39 (1.19–1.62)	1.24 (1.06–1.45)
Gender					
Males (ref.)	1.00	1.00	1.00	1.00	1.00
Females	1.16 (1.06–1.28)	1.16 (1.05–1.28)	1.16 (1.05–1.28)	1.16 (1.06–1.28)	1.24 (1.13–1.37)
Household social class					
Upper non-manual (ref.)		1.00			
Interm./lower non manual/entrepreneur/farmer		1.27 (1.11–1.46)			
Manual worker		1.33 (1.16–1.52)			
Household economic poverty			1.56 (1.37–1.77)		
Parental mental illness				1.35 (1.05–1.74)	
Psychiatric care in same age period					5.00 (4.37–5.71)

Source: All tables are based on authors' own calculations from the SBC data base.

Table A4

Associations between family relations in adolescence and in-patient somatic care at ages, 54–63 years. Incidence rate ratios (IRR) and 95% confidence intervals (95% CI) from Poisson regressions. Results statistically significant at the 5%-level are reported in bold. (n = 2463)

	Model 1	Model 2	Model 3	Model 4	Model 5
	IRR (95% CI)				
Family relations					
Good (ref.)	1.00	1.00	1.00	1.00	1.00
Intermediate	1.21 (1.12–1.31)	1.20 (1.11–1.30)	1.21 (1.12–1.31)	1.22 (1.12–1.31)	1.16 (1.07–1.25)
Poor	1.89 (1.68–2.11)	1.83 (1.63–2.05)	1.86 (1.66–2.08)	1.89 (1.69–2.11)	1.69 (1.51–1.90)
Gender					
Males (ref.)	1.00	1.00	1.00	1.00	1.00
Females	0.79 (0.73–0.85)	0.79 (0.73–0.85)	0.79 (0.73–0.85)	0.79 (0.73–0.85)	0.82 (0.76–0.88)
Household social class					
Upper non-manual (ref.)		1.00			
Interm./lower non manual/entrepreneur/farmer		1.28 (1.16–1.42)			
Manual worker		1.29 (1.17–1.44)			
Household economic poverty			1.17 (1.05–1.30)		
Parental mental illness				0.98 (0.79–1.21)	
Psychiatric care in same age period					3.24 (2.90–3.62)

Source: All tables are based on authors' own calculations from the SBC data base.

Table A5

Associations between family relations in adolescence and in-patient somatic care, separately by diagnostic category, at ages 44–63 years. Incidence rate ratios (IRR) and 95% confidence intervals (95% CI) from Poisson regressions. All models are adjusted for gender, household social class, household economic poverty, parental mental illness, and psychiatric care in the same age period. Results statistically significant at the 5%-level are reported in bold. n = 2525

	Coronary disease	Cancer	Respiratory disease	Neurologic disease	Infectious disease
	IRR (95% CI)				
Family relations					
Good (ref.)	1.00	1.00	1.00	1.00	1.00
Intermediate	1.01 (0.86–1.18)	0.96 (0.81–1.13)	1.63^b (1.18–2.25)	1.08 (0.78–1.48)	1.46^a (1.03–2.06)
Poor	1.34^a (1.05–1.70)	1.57^b (1.24–1.99)	1.63 (0.99–2.66)	1.52 (0.97–2.41)	1.28 (0.71–2.29)
% of participants with experiences of in-patient care	12.2	12.1	4.4	3.9	4.0
Number of events	723	667	180	180	145
	Endocrine disease	Gastro-intestinal disease	Urinary tract disease	Musculoskeletal disease	Other diseases
	IRR (95% CI)				
Family relations					
Good (ref.)	1.00	1.00	1.00	1.00	1.00
Intermediate	1.12 (0.74–1.68)	1.11 (0.95–1.31)	1.03 (0.81–1.31)	1.02 (0.85–1.24)	1.72^b (1.24–2.38)
Poor	1.02 (0.52–1.99)	1.32^a (1.04–1.68)	0.99 (0.65–1.50)	1.54^b (1.17–2.03)	1.12 (0.66–1.90)
% of participants with experiences of in-patient care	3.3	13.8	7.8	11.4	5.0
Number of events	105	698	292	491	176

Source: All tables are based on authors' own calculations from the SBC data base.

^a Not statistically significant with Bonferroni correction.

^b Statistically significant with Bonferroni correction.

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